The timing of Aurignacian occupation of the British Peninsula

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The timing of Aurignacian occupation of the British Peninsula
Die Chronologie des Aurignacien auf der britischen Halbinsel

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Abstract
Unlike regions farther south, the timing of the appearance of the Aurignacian in the far northwest of Europe is very poorly defined. This is the result of a less abundant archaeological record and problems associated with its early excavation. Here, comparison is made between characteristic British Aurignacian artefacts and those from well-stratified continental assemblages. *Burin busqué* bladelet cores are present in British collections, and these are technologically indistinguishable from those found in continental Europe. The technological complexity of these artefacts allows the conclusion that the Aurignacian first appeared on the British peninsula c. 32000 ^{14}C BP, or c. 37 000 years ago, at a time when the same *burin busqué* bladelet production method was being employed in southwestern France and in Belgium. The few radiocarbon measurements that date the British Aurignacian directly accord with this conclusion. The northward extension of the Aurignacian into Britain apparently occurred during or shortly after a particularly pronounced and prolonged warm climatic oscillation. This climatic event may suffice as explanation for the late appearance of the Aurignacian in Britain relative to other parts of Europe. The presence of two main methods of bladelet production probably indicates that Britain was the subject of two or more periods of Aurignacian occupation. The precise timing of what is interpreted as the later occupation is currently uncertain.

Zusammenfassung
Der Beginn des Aurignacien in Großbritannien ist nur ungenau definiert. Sämtliches bekanntes aurignacien- zeitliches Material stammt aus vermischten Inventaren, in denen sich auch Funde anderer paläolithischer Besiedlungsphasen befanden. Lithische Funde und Knochengeräte des Aurignacien müssen daher sorgfältig und ausschließlich anhand ihrer für das Aurignacien typischen Form und/oder ihres ^{14}C-Alters ausgewählt werden. Weder befinden sich sichere Silexartefakte des Aurignacien in Inventaren mit Aurignacien-Knochengeräten, noch ist der umgekehrte Fall belegt. Zur präziseren Datierung von Silexartefakten des britischen Aurignacien wird ein Vergleich mit gut stratifizierten Fundbeispielen des europäischen Festlandes durchgeführt. Komplexe, als burins busqués bezeichnete Lamellenkerne aus britischen Inventaren sind nicht von denen aus Maisières Canal und Trou Walou, Schicht CI-1 (Belgien) oder aus dem Abri Pataud, Schichten 7 und 6 (Dordogne) zu unterscheiden. Dazu weist eine Knochenspitze aus Großbritannien dieselbe Morphologie auf wie eine Spitze aus dem Abri Pataud. Eine kritische Überprüfung der ^{14}C-Chronologie dieser Fundstellen zeigt, daß Maisières Canal und Abri Pataud am zuverlässigsten datiert sind. In beiden Fällen wurde das ^{14}C -Alter der Inventare mit burin busqués auf etwa 32 000 ^{14}C BP bestimmt. Hingegen erscheinen die Daten aus Trou Walou als zu jung um das tatsächliche Alter des Aurignacien dieser Fundstelle zu datieren. Es wird hier die Ansicht vertreten, daß burins

busqués aus sämtlichen drei Fundstellen als weitgehend gleichzeitig angesehen werden sollten. Äquivalent zu ihrem ^{14}C -Alter von etwa 32 000 ^{14}C BP für Stücke aus SW-Frankreich und Belgien dürften auch die britischen burins busqués in etwa denselben Zeitraum datieren. Dies würde zudem mit den nicht allzu zahlreichen Radiokohlenstoffdaten für das britische Aurignacien übereinstimmen. Somit beginnt das Aurignacien in Großbritannien etwa 32 000 ^{14}C -Jahre vor heute.

Ebenfalls wird hier eine vorläufige Korrelation der Radiokohlenstoffdaten mit dem NorthGRIP Klimaprotokoll durchgeführt. Diese zeigt, daß das Aurignacien in Großbritannien während oder kurz nach dem am längsten andauernden Wärmeintervall innerhalb des europäischen Aurignacien erscheint. Als Ursache für eine Expansion des Aurignacien nach Norden wird eine Verbesserung der Klima- und Umweltbedingungen in dieser Zeit angenommen. Die geographische Verbreitung des britischen Aurignacien sowie die damals verwendete Jagdausrüstung stimmen mit dieser Interpretation überein. Das Auftreten von Paviland-Sticheln, eines weiteren komplexen Lamellenkerntyps, weist auf eine Aurignacienpräsenz hin, welche nach der ersten Besiedlungsphase datiert. Eine genauere zeitliche Einordnung ist anhand der ungenügenden Datenmenge jedoch derzeit nicht möglich.

Keywords

Early Upper Palaeolithic, Britain, northwestern Europe, chronology, lithic technology
Frühes Jungpaläolithikum, England, Nordwesteuropa, Chronologie, Silextechnologie

Introduction: The Aurignacian in north- western Europe

The final decade of the last century saw significant chronometric and taphonomic critique of archaeological succession at the beginning of the Upper Palaeolithic, led primarily by d'Errico and Zilhão (d'Errico et al. 1998; Zilhão & d'Errico 1999). By extension, this critique questioned models that explained how indigenous European Neanderthals were replaced by incoming modern humans, as inferred from this archaeological succession. The resulting debate continues to this day (e.g. see comments and reply in d'Errico et al. 1998; Zilhão & d'Errico 2003; Floss 2003; Mellars 2004, 2005, 2006; Gravina et al. 2005; d'Errico et al. 2006; Zilhão 2006; Zilhão et al. 2006, 2008; Mellars et al. 2007; Mellars & Gravina 2008; Riel-Salvatore et al. 2008: Higham et al.
2010; Caron et al. 2011). In the light of this, concerted efforts have been made to clarify the archaeological integrity of sequences and assemblages which relate to this period (e.g. Bordes 2003; Bon 2006; Flas et al. in press), and to create an improved chronology by updating and expanding what was, in retrospect, a highly problematic radiocarbon database (Higham et al. 2006; Joris & Street 2008; Higham 2011).

For most, the Aurignacian (c. 37 000-30 000 ^{14}C BP) was created by the first modern humans to success- fully occupy Europe, and is therefore of particular significance within Palaeolithic archaeology. To better understand the timing of its appearance, Aurignacian levels and stratigraphies in key regions have been the subject of recent programmes of radiocarbon dating, including in Italy (Higham et al. 2009), the Swabian Jura (Conard & Bolus 2008), southern France (Higham et al. 2011) and northern France (Higham et al. 2010). The main aim of these studies has been to establish appearance dates for the Earlier Aurignacian, sometimes separated into the Proto-Aurignacian (*Protoaurignacien*) and Early Aurignacian (*Aurignacien ancien*).

The later stages of the Aurignacian and their chronological relationship with the succeeding Gravettian have been the focus of less attention. When compared to the Early and Proto-Aurignacian, well-stratified Recent Aurignacian levels in France are rare (Djindjian et al. 1999; Bordes 2006: 158) and are also poorly dated. Radiocarbon dates for the French and Belgian Recent Aurignacian can be found in Figure 1. Available dates are few relative to other periods of the Earlier Upper Palaeolithic, and are notably inconsistent with one another. An overall paucity of radiocarbon data is confounded by the acknowledgement that many dates for this period are chronometrically suspect, due to them coming from non-AMS laboratories or from laboratories whose pre-treatment of samples has improved since these dates were run. It is now clear that a significant number of radiocarbon dates ostensibly dating this period are erroneously young (Zilhão & d'Errico 1999; Pettitt et al. 2003; Higham 2011). It is difficult to say which, if any, of the data in Figure 1 are likely to be correct.

Site	Layer/area	Lab Code	Measurement	Sample	Reference
La Ferrassie	E1s	Gif-2701	23 580 ± 550	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	G1	OxA-405	29 000 ± 850	Bone	Mellars et al. 1987
La Ferrassie	G1	GrN-5750	30 970 ± 395	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	G1 sb/c	Gif-4268	22 690 ± 240	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	G1 sc/d	Gif-4269	23 020 ± 240	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	J	Gif-4273	26 750 ± 250	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	J	GrA-31934	24 710 ± 110	Charred bone	Bertran et al. 2008
La Ferrassie	K2	Gif-4274	27 470 ± 280	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	K3	OxA-15218	33 610 ± 340	Bone	Higham et al. 2006
La Ferrassie	K3b	Gif-4275	27 130 ± 320	Bone	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	K4	Gif-4277	31 130 ± 300	?	Delibrias 1984 cited in Bertran et al. 2008
La Ferrassie	K4	OxA-409	28 600 ± 1 050	?	Mellars et al. 1987
Abri Pataud	6, lens 1	OxA-582	24 340 ± 700	Collagen amino acids	Gowlett et al. 1987 cited in Higham et al. 2011
Abri Pataud	6, lens 1	OxA-688	19 700 ± 350	Collagen amino acids	Gowlett et al. 1987 cited in Higham et al. 2011
Abri Pataud	6, lens 1	OxA-689	26 600 ± 800	Collagen amino acids	Gowlett et al. 1987 cited in Higham et al. 2011
Abri Pataud	7, hearth W-1	GrN-3105	29 300 ± 450	Charcoal	Vogel & Waterbolk 1967 cited in Chiotti 2005
Abri Pataud	7, hearth W-1	GrN-4531	31 800 ± 310	Bone	Vogel & Waterbolk 1967 cited in Chiotti 2005
Abri Pataud	7, hearth W-1	GrN-3116	32 900 ± 700	Charcoal	Vogel & Waterbolk 1967 cited in Chiotti 2005

Trou Al'Wesse	?	OxA-7496	30 750 ± 850	Osseous point	Otte et al. 1998
Trou du Renard	B	GrA-28196	27 920 ± 210	Cutmarked bone	Flas 2005
Trou Magrite	?	OxA-6564	25 080 ± 320	Osseous point	Charles et al. 2003
Trou Magrite	2	GX-18538G	30 100 ± 2 200	Bone	Straus 1995
Trou Magrite	2	GX-18537G	34 225 ± 1 925	Bone	Straus 1995

Figure 1 A selection of 14C dates for Recent Aurignacian assemblages/levels/artefacts in southwestern France (La Ferrassie, Abri Pataud) and Belgium (Trou Al'Wesse, Trou du Renard, Trou Magrite), prior to the recent publication of Higham et al. (2011).

Abb. 1. Ausgewählte 14C-Datierungen für Inventare, Schichten bzw. Artefakte des Aurignacien récent in Südwestfrankreich (La Ferrassie, Abri Pataud) und Belgien (Trou Al'Wesse, Trou du Renard, Trou Magrite); vor der neuen Publikation von Higham et al. (2011).

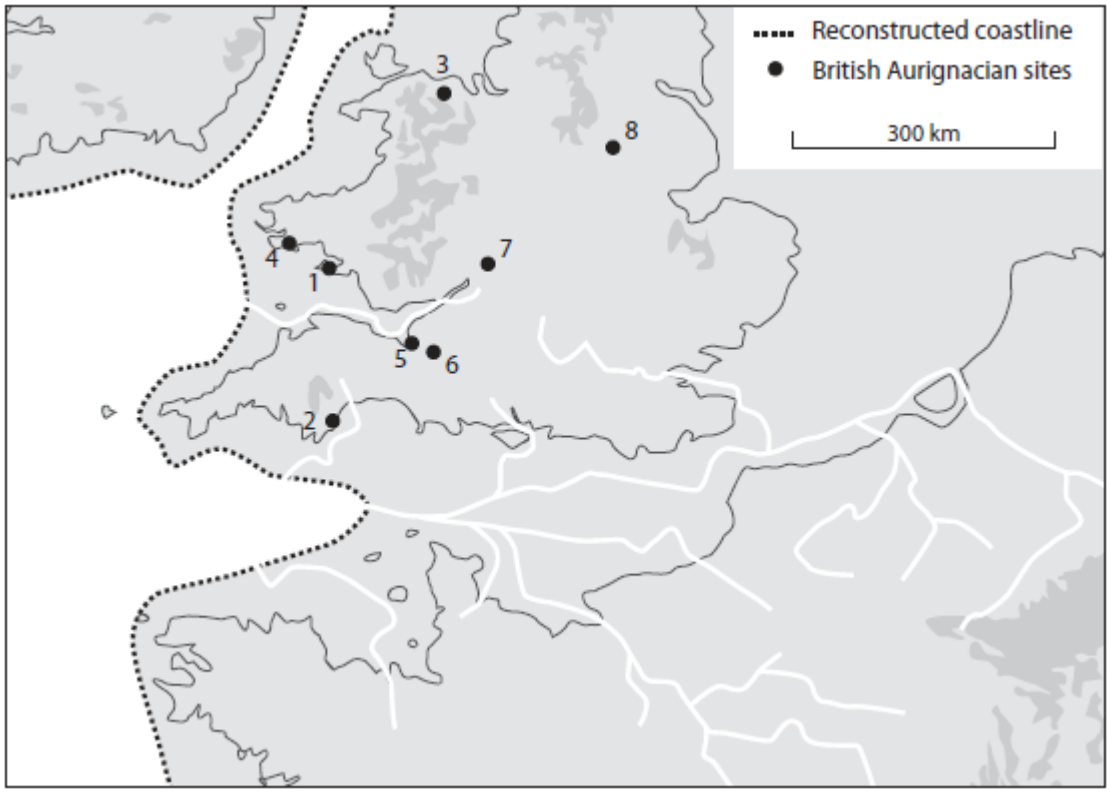

Figure 2 Fig. 2. British Aurignacian sites - Certain Aurignacian: 1. Goat's Hole, Paviland, 2. Kent's Cavern, 3. Ffynnon Beuno, 4. Hoyle's Mouth, 5. Uphill Quarry, 6. Hyaena Den; *Probable Aurignacian*: 7. Aston Mill, 8. Pin Hole, Creswell Crags. Dotted line indicates sea level c. 75m below present day level, corresponding broadly to its position during the Aurignacian. The white lines indicate the inferred position of major river systems during the Aurignacian.

Abb. 2. Fundstellen des Aurignacien in Großbritannien – Gesichertes Aurignacien: 1. Goat's Hole, Paviland, 2. Kent's Cavern, 3. Ffynnon Beuno, 4. Hoyle's Mouth, 5. Uphill Quarry, 6. Hyaena Den; Wahrscheinliches Aurignacian: 7. Aston Mill, 8. Pin Hole, Creswell Crags. Meeresspiegel dargestellt bei 75m unter heutigem Niveau, weitgehend konform mit dessen Stand während des Aurignacien. Die angenommene Lage größerer Flußsysteme während des Aurignacien ist ebenfalls eingezeichnet.

In the far northwest of Europe the chronology of the entire Aurignacian remains very poorly defined, for several reasons. Chief amongst these is that assemblages documenting Aurignacian activity over a prolonged time period are confined to a handful of cave sites in Belgium (e.g. Trou Magrite, Spy: see Otte 1979). These sites were excavated when archaeology as a scientific discipline was in its infancy, and as a result high-resolution ancillary stratigraphic data is frustratingly absent. Good stratigraphic data is likewise missing from smaller but nonetheless regionally important Aurignacian assemblages. The assemblage from Goat's Hole, Paviland (south Wales) is a good example of this: although in the

main an Aurignacian assemblage, the collection actually contains material from several Upper Palaeolithic and Mesolithic occupations of the site, and there is no spatial data with which to attempt stratigraphic separation of these (Sollas 1913; Swainston 2000).

For these mixed, multiple occupation cave assemblages, the separation of archaeological material into different occupation phases must be undertaken with great care. In terms of radiocarbon dating, single humanly-modified artefacts can, in some cases, be used to date an Aurignacian presence (e.g. Flas et al. in press). However, confident association of these individual measurements with particular phases of the Aurignacian is rarely possible.

In order to understand the chronology of the British Aurignacian, a different approach is required. Through a combination of careful consideration of Aurignacian archaeology, comparison with well-stratified assemblages in neighbouring regions, and a critical approach to published radiocarbon data, the age of artefacts and assemblages can be confidently inferred. Here, this approach is used to determine when the Aurignacian spread into Britain.

The Aurignacian of Britain

British Aurignacian findspots are plotted in Figure 2 (Jacobi & Pettitt 2000, Jacobi et al. 2006, Dinnis 2009). Two features of Figure 2 are worth highlighting. The first is that, unlike all other British Upper Palaeolithic occupations, the Aurignacian is restricted to upland regions in the west and north. The second is Aurignacian Britain's status as the northwesternmost part of mainland Europe, with the huge Channel River dominating this corner of the continent. It is this river valley that would have first brought Aurignacian hunter-gatherers onto British terrain (Dinnis 2008).

At all of the sites in Figure 2, Aurignacian material is poorly- or un-stratified, and all the sites' assemblages derive from multiple Palaeolithic occupations. As a result, only securely Aurignacian index fossils can be selected from collections for study. Lithic pieces identifiable as Aurignacian are almost exclusively carinated artefacts. These are now known to be discarded cores from the production of a micro-lithic bladelet technology (e.g. Lucas 1997; Chiotti 2003; Hays & Lucas 2000; Le Brun-Ricalens et al. 2005; Pesesse & Michel 2006). This is further explained below, where two of these bladelet core artefact types are considered in more detail.

Radiocarbon data from all sites helps to confirm their Marine Isotope Stage 3 (MIS3) age (c. 65-25000 years ago). However, at no site can dated objects be meaningfully associated with Aurignacian lithic artefacts.

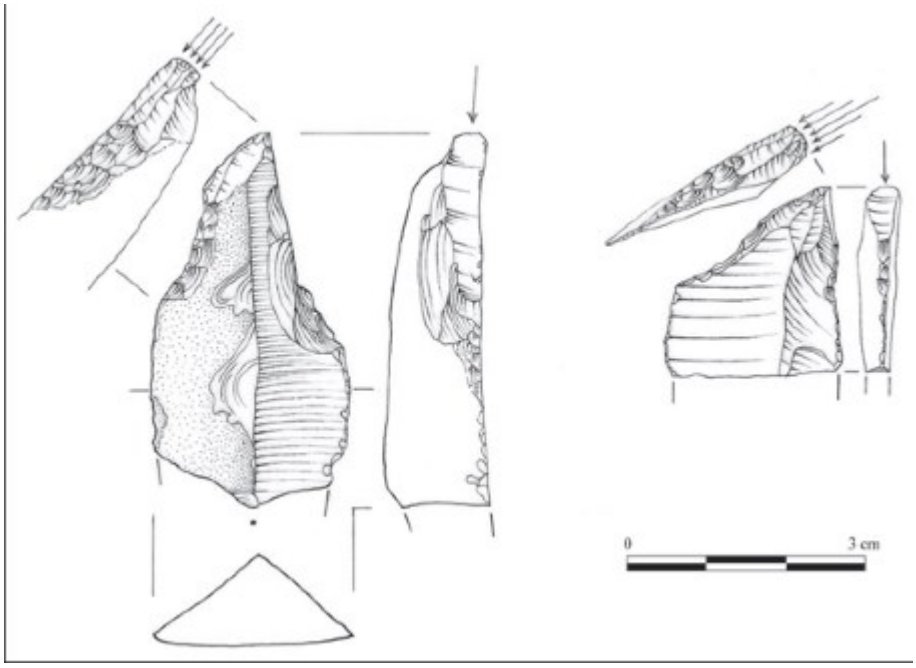

Figure 3 Burins busqués from Ffynnon Beuno (left) and from Hoyle's Mouth (right). (Illustrations: A. David).

Abb. 3. Burins busqués aus Ffynnon Beuno (links) und Hoyle's Mouth (rechts). (Zeichnungen von A. David).

British Aurignacian material

Ffynnon Beuno, Denbighshire

Excavated over several seasons from 1883 by Hicks, Ffynnon Beuno Cave yielded fauna consistent with an MIS3 age (Hicks 1886; Green & Walker 1991; Aldhouse-Green & Pettitt 1998; Currant & Jacobi 2001, 2011). In the same cave fill was a lithic assemblage from which six artefacts are known to have been accessioned to museum collections. These six artefacts represent only an extremely small proportion of what would have originally been present in the cave. Nonetheless, at least two separate Palaeolithic occupations of the site can be inferred from them. The only unambiguously Aurignacian artefact is the *burin busqué* in Figure 3.

A single published radiocarbon date from Ffynnon Beuno of 18 000 +1 400/-1 200 BP (Birm-146) comes from unworked mammoth ivory (Aldhouse-Green & Pettitt 1998). This is likely to be erroneously young (see Currant & Jacobi 2001, 2011), and its spatial asso- ciation with any lithic material from the site is unknown.

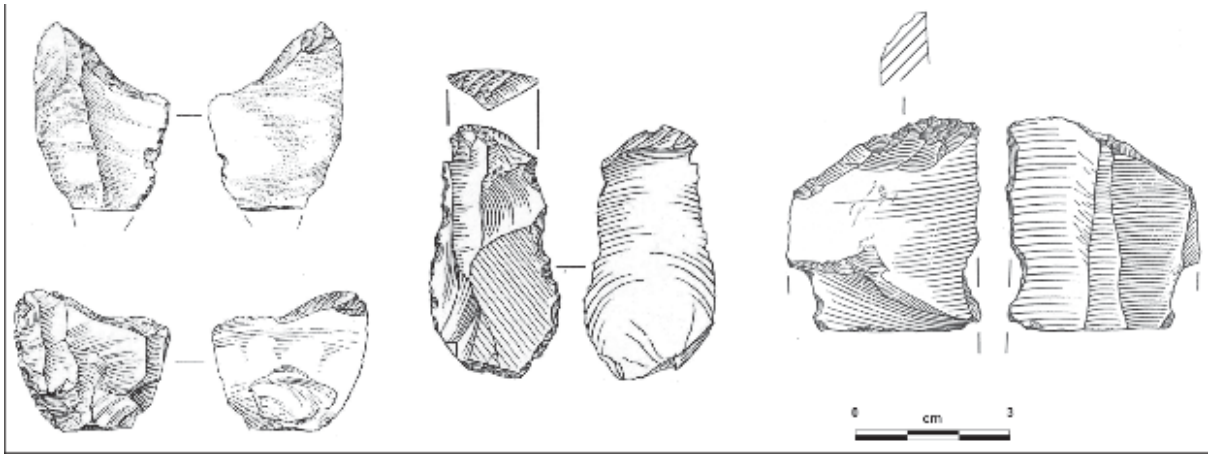

Figure 4 Paviland burins from Paviland (left and middle) and from Kent's Cavern (right). (Illustrations: J. Wallis [left] and H. Martingell [middle and right]).

Abb. 4. Paviland-Stichel aus Paviland (links und Mitte) und Kent's Cavern (rechts). (Zeichnungen von J. Wallis, H. Martingell).

Hoyle's Mouth, Pembrokeshire

Another *burin busqué* can be found in the lithic assemblage from Hoyle's Mouth (Figs. 2 & 3). Excavation of Hoyle's Mouth was undertaken by various explorers during the 19th century, and then by Savory and later Green in the latter part of the 20th century (Garrod 1926; Savory 1973; Green & Walker 1991). Palaeolithic material from Hoyle's Mouth is predominantly Late Upper Palaeolithic (David 1991, 2007; Green & Walker 1991). However, the presence of woolly rhinoceros and hyaena in the faunal collection (David 1991) and three radiocarbon dates in the range of 26-28 000 ^{14}C BP (Aldhouse-Green & Pettitt 1998) demonstrate that part of the assemblage is MIS3 in age (i.e. significantly older than the Late Upper Palaeolithic lithic assemblage). The Aurignacian *burin busqué* can likewise be considered to be older than the majority of the lithic assemblage (David 1991; Green & Walker 1991), although as the spatial association between the dated material and this artefact is unknown, none of the three radiocarbon measurements can be said to date it.

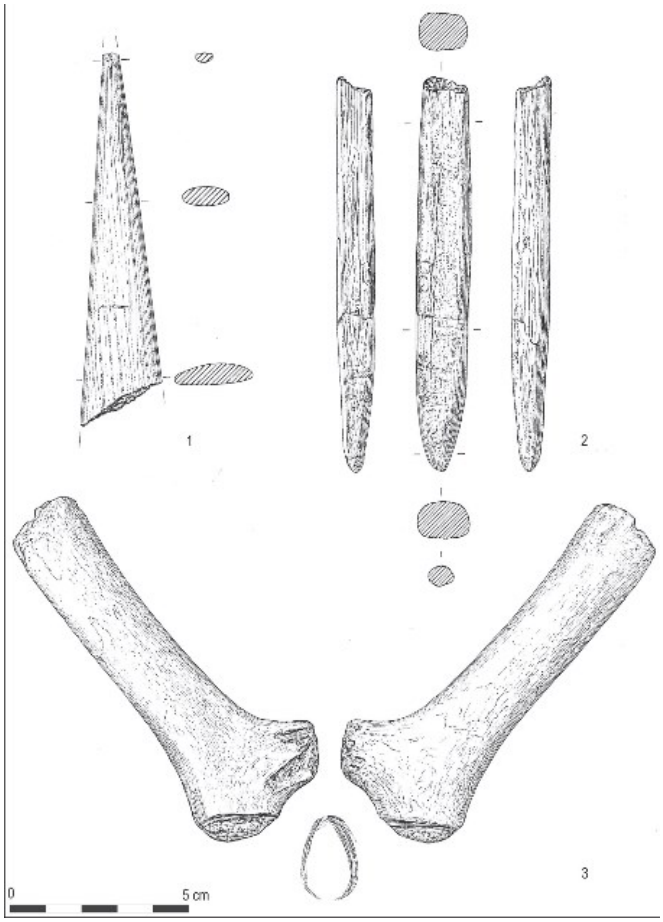

Figure 5 Aurignacian points from Uphill Quarry (top left) and Hyaena Den (top right), and a humanly modified antler from Pin Hole, Creswell Crags (bottom). (Illustrations: J. Cross; from Jacobi & Higham [2011]).

Abb. 5. Spitzen des Aurignacien aus Uphill Quarry (oben links) und Hyaena Den (oben rechts), sowie ein artifiziell modifiziertes Geweihstück aus Pin Hole, Creswell Crags (bottom). (Zeichnungen von J. Cross aus Jacobi & Higham [2011]).

Goat's Hole, Paviland, Glamorganshire

Goat's Hole at Paviland – henceforth referred to simply as "Paviland" – is by far the richest Aurignacian site in Britain, and has a long and complex history of collection and excavation (see Swainston & Brookes 2000). The most notable periods of work are those by Buckland in 1823, during which the ochre-stained partial skeleton of an Upper Palaeolithic burial was recovered (the so-called "Red Lady of Paviland"), and later excavations led by William Sollas in 1912. A large majority (c. 80%) of the extant lithic collection comes from the work of Sollas.

Sollas (1913) published the site as an "Aurignacian Station", identifying the assemblage as a mixture of different archaeological cultures from Middle Palaeolithic to Mesolithic, but with the majority being Aurignacian. Although disagreeing about the minutiae of the assemblage's contents, subsequent researchers have likewise seen the assemblage as predominantly Aurignacian (Campbell 1980; Jacobi 1980; Swainston 2000; Jacobi & Higham 2008; Dinnis 2009).

Forty-eight lithic artefacts from Paviland can be considered securely Aurignacian (Dinnis 2009). Of these 48, 41 are bladelet-core artefacts: 23 Paviland burins (Fig. 4), 7 carinated burins, 8 thick nosed scrapers and 3*burins busqués*. The remaining seven are non-bladelet-core flat nosed scrapers.

Recent radiocarbon dates from the Paviland collection show that it contains material from various periods of MIS3 (Jacobi & Higham 2008; Jacobi et al. 2009). With no stratigraphic information available, linking the site's Aurignacian lithics with any particular radiocarbon date is impossible.

Kent's Cavern, Devonshire

The final British site to have yielded securely Aurignacian lithic material is Kent's Cavern. Several lithic artefacts from the early excavations of William Pengelly were recognised by Garrod (1926) as Aurignacian. Later excavations by the Torquay Natural History Society (1926-1929) located an extension of this Aurignacian assemblage.

A carinated burin (Jacobi & Higham 2011), a Paviland burin (Fig. 4) and two flat nosed scrapers were recovered during these excavations. Four radiocarbon dates of c. 28-35 000 ^{14}C BP confirm the broad Aurignacian age of the Aurignacian material from Kent's Cavern, but none can be used to date it with more precision (R. Jacobi pers. comm.).

Aston Mill, Worcestershire

The status of Aston Mill as an Aurignacian site is less certain. Primarily of palaeontological interest, sand and gravel deposits at Aston Mill and nearby Beckford have yielded fauna including mammoth, wild horse and reindeer (Briggs et al. 1975; Rackman 1981). Radiocarbon dates of 26 000 ± 300 BP (Birm-382), 29 500 +1 700/-1 400 BP (Birm-504) and 31 900 +860/-750 BP (Birm-505) on organic material from Aston Mill and of 27 650 ± 250 BP (Birm-293) from Beckford (Rackman 1981) confirm the MIS3 age of these deposits.

Amongst a sizeable number of handaxes from Aston Mill are several Early Upper Palaeolithic artefacts. Jacobi & Pettitt (2000) suggested that these were Aurignacian on the basis that one was an Aurignacian flat nosed scraper. While this classification is reasonable, it is notably atypical in form (Dinnis 2009). Furthermore, it is unclear precisely where at the site the artefact originated, and it does not appear to have been collected from *in situ* Pleistocene deposits. The site's status as an Aurignacian findspot is therefore certainly less secure than the others described above.

	Lab. Code	Measurement	Reference
Abri Pataud Level 6	OxA-21681	31 200 ± 400	Higham et al. 2011
Abri Pataud Level 6	OxA-22778	31 850 ± 450	Higham et al. 2011
Abri Pataud Level 6	OxA-21676	31 250 ± 400	Higham et al. 2011
	Lab. Code	**Measurement**	**Reference**
Abri Pataud Level 7	OxA-21583	32 400 ± 450	Higham et al. 2011
Abri Pataud Level 7	OxA-21584	32 200 ± 450	Higham et al. 2011
Abri Pataud Level 7	OxA-2276-20	32 150 ± 450	Higham et al. 2011
Abri Pataud Level 7	OxA-21680	32 850 ± 500	Higham et al. 2011
Pin Hole	OxA-15053	32 640 ± 340	Jacobi & Higham 2011
Uphill Quarry	OxA-13716	31 730 ± 250	Jacobi et al. 2006
Hyaena Den	OxA-13803	31 550 ± 340	Jacobi et al. 2006
Red Lady of Paviland	OxA-16412	28 870 ± 180	Jacobi & Higham 2008
Red Lady of Paviland	OxA-16413	29 490 ± 210	Jacobi & Higham 2008
Maisières Canal Gravettian	OxA-18007	27 950 ± 170	Jacobi et al. 2010

Figure 6 Radiocarbon data for the Recent Aurignacian levels 7 and 6 of Abri Pataud (Dordogne, France), the Aurignacian of Britain (Pin Hole, Uphill Quarry and Hyaena Den), the "Red Lady of Paviland" burial and the Early Gravettian of Maisières Canal in Belgium. All dates come from human or humanly modified bone, and all have had ultrafiltration pretreatment of samples. OxA-21676 and OxA-21677 are repeat measure- ments from the same bone. The two dates for the Red Lady are those argued by Jacobi & Higham (2008) as most reliable. Jacobi et al. (2010) give good reason to believe that OxA-18007 is archaeologically most securely attached to the lithic assemblage it purports to date, and this single measurement is therefore used here to represent the age of the Early Gravettian of Maisières Canal. For

Jacobi et al. (2010), the age of the Maisières Canal Early Gravettian is also the age of the British Early Gravettian.

Abb. 6. Radiokohlenstoffdatierungen des Aurignacien récent von Abri Pataud, Schicht 7 und 6, des britischen Aurignacien (Pin Hole, Uphill Quarry und Hyaena Den), der „Red Lady of Paviland" Bestattung und des frühen Gravettien aus Maisières Canal in Belgien. Sämtliche Daten stammen aus Proben von menschlichen oder artifiziell modifizierten Knochen welche mittels Ultrafiltration vorbehandelt wurden. Bei OxA-21676 und OxA-21677 handelt es sich um nacheinander erfolgte Messungen derselben Knochenprobe. Die beiden Datierungen der „Red Lady" werden von Jacobi und Higham (2008) als am zuverlässigsten angesehen. Jacobi et al. (2010) geben eine begründete Annahme dafür, daß OxA-18007 archäologisch nahezu absolut sicher mit dem Silexinventar assoziiert ist, und dieses damit datiert, obwohl es sich um ein Einzeldatum handelt. Es wird daher an dieser Stelle zur Datierung des frühen Gravettien von Maisières Canal verwendet. Des weiteren setzen Jacobi et al. (2010) das Alter des frühen Gravettien von Maisières Canal mit dem frühen Gravettien Großbritanniens gleich.

Uphill Quarry, Somerset

Only one characteristically Aurignacian osseous artefact has been found in British collections. This is the point fragment from the now destroyed caves and fissures at Uphill Quarry (Fig. 5). It is made from bone or, more likely, antler (Jacobi et al. 2006), and its form is typical of lozangic points found in the Recent Aurignacian of southwestern France and Belgium (Otte 1979; Jacobi & Pettitt 2000). The radiocarbon age of the point is given in Figure 6 and a modelled corrected age for it is presented in Figure 7.

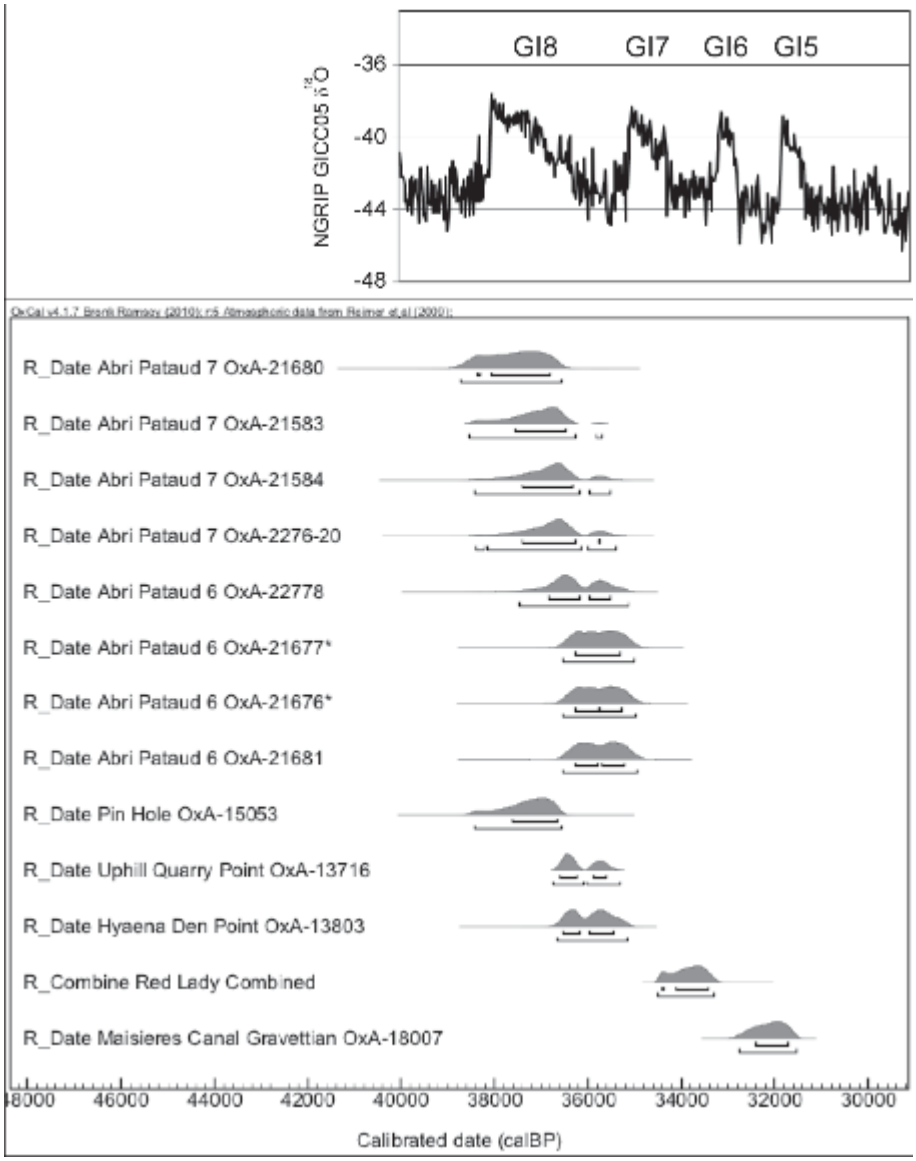

Figure 7 Age models for radiocarbon measurements in Figure 6. Radiocarbon data presented using OxCal v4.1.7 (Bronk-Ramsey 2010) and corrected using data from Reimer et al. (2009). The two dates for the Red Lady burial in Table 1 have been combined using OxCal's R_Combine function. Bars beneath each measurement represent age ranges at 68.3 % and 95.5 % probability. Data is compared to the NorthGRIP GICC05 climatic record of Svensson et al. (2008). Greenland Interstadials (GI8-5) are indicated.

Abb. 7. Chronologiemodell für die 14C-Daten aus Abb. 6. Die Radiokohlenstoffdatierungen wurden mittels OxCal v4.1.7 (Bronk-Ramsey 2010) kalibriert und anhand der Daten aus Reimer et al. (2009) korrigiert. Die beiden Datierungen für die „Red Lady" Bestattung in Tabelle 1 wurden mittels OxCal R_Combine kombiniert. Balken unterhalb jeder Messung zeigen Spannweiten von 68,3 % und 95,5 % Wahrscheinlichkeit an. Datenabgleich erfolgte mit dem NorthGRIP GICC05 Klimaprotokoll aus Svensson et al. (2008). Grönland Interstadiale (GI8-5) sind markiert.

Hyaena Den, Somerset

Within the mixed assemblage from nearby Hyaena Den is a bone or antler osseous point fragment (Figs. 2 & 5). Although undiagnostic, comparable pieces can be found in Aurignacian assemblages elsewhere (Jacobi et al. 2006). Its geographical proximity to the Uphill Quarry point and the similarity

of radiocarbon dates for the two pieces means that it can reasonably be considered to belong to the Aurignacian (Jacobi et al. 2006; Jacobi 2007) (Figs. 6 & 7).

Pin Hole, Creswell Crags, Derbyshire

Previously, some have considered as Aurignacian an endscaper in the Upper Palaeolithic assemblage from Robin Hood Cave, Creswell Crags (e.g. Swainston 1999: 43). For others, artefacts such as this plausibly belong to other periods of the Upper Palaeolithic, and therefore their Aurignacian attribution is unsecure (e.g. Jacobi & Pettitt 2000; Dinnis 2009). Without corroborating stratigraphy, the latter stance is necessary. However, this is not to say that there is no Aurignacian at Creswell Crags: rather, no *diagnostically* Aurignacian material is present there. Indeed, every other British Late Middle and Upper Palaeolithic occupation is represented in the caves of Creswell, and the presence of a limited amount of Aurignacian material would be by no means unfeasible.

The age of an undiagnostic modified antler from Pin Hole at Creswell Crags certainly indicates occupation during the Aurignacian (Figs. 5 & 6): its radiocarbon age would now be considered too young to attach it to the preceding Lincombian-Ranisian-Jerzmanowician (LRJ: c. 38-36 000 ^{14}C BP [Jacobi 2007]) and too old for it to belong to the succeeding Early Gravettian (Maisièrian: 28 000 ^{14}C BP [Jacobi et al. 2010]). On typological grounds this is the least securely Aurignacian of the osseous artefacts discussed, but its age alone is nonetheless sound reason to believe that it derives from an Aurignacian occupation at the site (see Figs. 6 & 7).

The character of the British Aurignacian and methods of bladelet production

Despite an overall paucity of material, several observations regarding the British Aurignacian can be made.

First, the British Aurignacian is comparable to the Recent Aurignacian of France and Belgium, as has been suggested previously (e.g. Otte 1979; Campbell 1980; Aldhouse-Green & Pettitt 1998; Jacobi & Pettitt 2000; Swainston 2000). All of the lithic artefacts described above would fit better in Recent rather than Earlier Aurignacian assemblages, and the Uphill Quarry point fragment is typically Recent Aurignacian in its form. Despite some evidence for Earlier Aurignacian occupation of neighbouring Belgium (Otte 1979; Flas 2008; Dinnis 2009; Flas et al. in press) there is, at least presently, no evidence for Earlier Aurignacian occupation of Britain.

Second – and an obvious problem – is that Aurignacian stone and osseous artefacts are not found at the same sites. No radiocarbon date meaningfully associated with the Aurignacian exists for any lithic findspot. To determine the age of British Aurignacian lithic material, one must therefore look to neighbouring regions.

Finally, it is apparent that the variety of methods used to produce bladelets in Britain was much more restricted than in the Aurignacian of Belgium or France. Of the artefacts described above, *burins busqués*, Paviland burins, carinated burins and thick nosed scrapers are all discarded bladelet cores. Absent bladelet core types include carinated scrapers, narrow-fronted carinated scrapers and *burins des Vachons*. All seven of these core types can be found in neighbouring Belgium (Otte 1979; Flas et al. in press).

Furthermore, technological preferences in Britain are even more restricted than this. The thick nosed scraper method is the preferred method of bladelet production at sites in Belgium and France (e.g. Spy, Abri Pataud level 8: Otte 1979; Chiotti 2005; Dinnis 2009; Flas et al. in press). Conversely, in Britain it is simply the ad hoc use of a relatively simple technique, in order that poor quality, locally sourced material can be exploited (Dinnis in press).

Preferred techniques of bladelet production in the British Aurignacian are the *burin busqué* method (Ffynnon Beuno, Hoyle's Mouth, Paviland) and the Paviland burin and carinated burin methods (Kent's Cavern, Paviland). The most technologically complex and therefore culturally informative of these are the *burin busqué* and Paviland burin techniques (Dinnis in press).

The burin busqué

The *burin busqué* method of bladelet production was used across western Europe during the Recent Aurignacian for the production of highly standar- dised, micro-lithic bladelets. The complexity and consistency of their technology across a large geo- graphical area should not be understated: it is this technological complexity and consistency which makes the *burin busqué* the most secure lithic index fossil of the Aurignacian.

Bladelets produced from *burins busqués* were similarly remarkably consistent: short (<2cm) and slender, curved through their length and on their left margin, and with a notable axial anticlockwise torsion. These bladelets were then frequently finely retouched ventrally (or bifacially on alternate margins) to produce Dufour bladelets of the Roc-de-Combe subtype. In addition, bladelet blanks were sometimes removed from the area of the *burin busqué* core close to, and partially encompassing, its ventral surface. This resulted in a bladelet blank with a characteristically triangular or trapezoidal cross-section, morphologically different from the usual bladelet débitage used to create Dufour bladelets. This bladelet type was sometimes retouched dorsally down one margin, i.e. differently from Dufour bladelets. These retouched bladelets are referred to as Caminade bladelets (Bordes & Lenoble 2002).

Retouched Dufour and Caminade bladelets have been found in association with their parent core *burins busqués* in southwestern France and in Belgium (Bordes & Lenoble 2002; Flas et al. 2007). Of the British examples, the *burin busqué* from Ffynnon Beuno in particular has a morphology suggesting that it was used to produce both bladelet types.

	Core preparation and reduction			Bladelet morphology				
	Blanks exploited	Platform creation and maintenance	Débitage area restriction	Mean length of bladelets produced (as determined from negative scars)	Curvature	Curvature of margins	Torsion	End product
Burin busqué	Wide blades/ laminar flakes with regular dorsal scars. Fine quality and often exogenous mate- rial favoured	Burin removal scar positioned 90° to the ventral and dorsal surfaces, positioned on the right sidein c. 90 % of cases. This is renewed with further burin removals if/when bladelet débitage detachment becomes problematic	Retouched stop-notch limits bladelet débitage sur- face distally	15mm	Variable but always present	Left side, most pronounced distally	Anti- clockwise	Small Dufour bladelets (Roc-de- Combe subtype)
Paviland burin	Wide blades/ laminar flakes with regular dorsal scars. Fine quality and often exogenous mate- rial favoured	Burin-type removal scar orientated towards the dorsal surface, always positioned on the left side. Sometimes no evidence for any platform creation, and therefore the unal- tered dorsal surface possibly sufficed for bladelet detachment	Sometimes retouched to limit bladelet débitage sur- face laterally	12mm	Variable but always present. Less pronounced than for bladelets from burins busqués	Left side, most pronounced distally	Anti- clockwise	??

Figure 8 Comparison of technological characteristics of burins busqués and Paviland burins and their bladelet débitage. These observations are based upon a sample of 205 burins busqués from French, Belgian and British collections and a sample of 40 Paviland burins from Belgian and British collections (see Dinnis [in press] for details; see also Figs. 3 & 4).

Abb. 8. Vergleich der technologischen Merkmale von burins busqués und Paviland-Sticheln sowie deren Lamellenproduktion. Die Beobachtungen basieren auf einer Auswahl von 205 burins busqués

aus französischen, belgischen und britischen Inventaren sowie 40 Paviland- Sticheln aus belgischen und britischen Sammlungen (für Detailangaben siehe Dinnis, im Druck; siehe ebenfalls Abb. 3 und 4).

The Paviland burin

On account of their similarity to other bladelet-core artefact types such as the *burin busqué*, Paviland burins can also be understood as discarded cores from micro-lithic bladelet production (Dinnis 2008).

Unfortunately, Aurignacian bladelets from any core type are entirely absent from British Aurignacian assemblages, due to the lack of screening of material during early excavations. However, despite clear differences in the process through which bladelets were detached from their respective cores, core morphology indicates that bladelets from *burins busqués* and from Paviland burins would have been comparable in size and shape (Dinnis 2008, in press). Hence, the *burin busqué* and Paviland burin techniques are different methods to achieve a very similar end result. Figure 8 summarises the technological differences between the two core types, and the similarity of the bladelet débitage from them.

The timing of the British Aurignacian

Evidence from Abri Pataud

As already stated, there are relatively few well-stratified Recent Aurignacian assemblages from France. Abri Pataud (Dordogne) is an obvious exception. The site has a coherent stratigraphy of 14 Upper Palaeolithic levels, of which the basal nine document the evolution of the southwestern French Aurignacian. At least three of these nine levels document the Recent Aurignacian (levels 8-6).

The importance of Abri Pataud here is its status as the only site with two Recent Aurignacian levels containing *burins busqués* (levels 7 and 6) stratified below an Early Gravettian level (level 5) (Chiotti 2005; Pesesse 2010). Level 7 contains abundant typical *burin busqués* (n=78), with a smaller number of examples from the overlying level 6 (n=15) (Fig. 9).

The integrity of the stratigraphy of Abri Pataud is generally well-accepted, although taphonomic and geoarchaeological scrutiny continues to be applied. A recent assessment of levels 7 and 6 found them to have undergone little post-depositional alteration (Agsous et al. 2006: 38 cited in Pesesse 2010). This is good reason to believe that the archaeology within
these levels is unmixed.

Recent radiocarbon dating of the Aurignacian levels at Abri Pataud confirms the coherence of its stratigraphy, and for the first time provides reliable radiocarbon data for the latest Aurignacian levels (Higham et al. 2011) (Figs. 6 & 7). Central values for measurements from level 7 all lie in the range 33-32 000 ^{14}C BP, and those in the overlying level 6 in the range 32-31 000 ^{14}C BP. They therefore accord with measurements for the Aurignacian points from Uphill Quarry and Hyaena Den and with the modified antler from Pin Hole (Figs. 6 & 7).

It is worthy of note that the osseous industry of "level 7 upper" includes an antler lozangic point (Vercoutère 2004: 130), similar to that from Uphill Quarry. In cross-section both points are elliptical in their distal portion and more plano-convex in their mesial portion (see Fig. 5). In his study of lithic material from the Aurignacian levels of Abri Pataud, Chiotti (2005) attached the small amount of material assigned to "level 7 upper" to the overlying level 6, rather than to the large assemblage from "level 7 lower". As described, the central values of the new radiocarbon data for level 6 are all 32-31 000 ^{14}C BP, and this may therefore be the age of the lozangic point. Of course, this is also the age of the lozangic point from Uphill Quarry (Fig 6).

Finally, it can be stressed that the new dating of Abri Pataud shows previous dates for level 6 to have been erroneously young, casting doubt on other, similarly young dates in Figure 1.

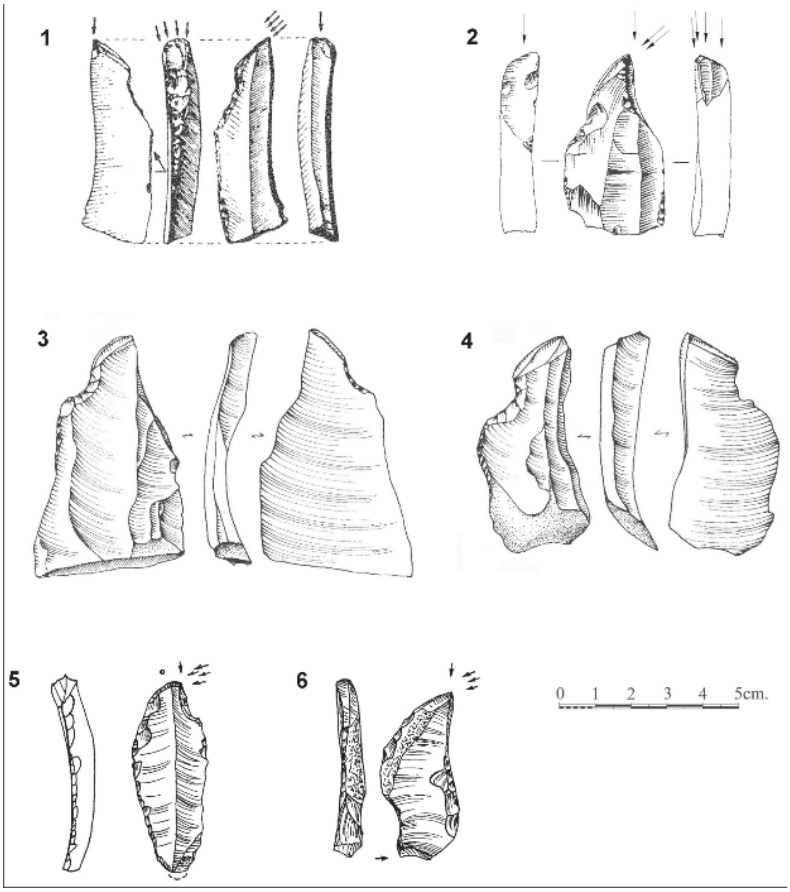

Figure 9 Burins busqués from Abri Pataud 7 (1), Abri Pataud 6 (2) (both from Chiotti 2005), Maisières Canal (3, 4) (Flas et al. 2007) and Trou Walou (5, 6) (Kozlowski & Sachse-Kozlowska 1993). Compare with the British *burins busqués* in Figure 3.

Abb. 9. Burins busqués aus Abri Pataud 7 (1), Abri Pataud 6 (2) (Chiotti 2005), Maisières Canal (3, 4) (Flas et al. 2007) und Trou Walou (5, 6) (Kozlowski & Sachse-Kozlowska 1993). Vergleiche hierzu die britischen burins busqués aus Abbildung 3.

Evidence from Belgium

The Upper Palaeolithic of Britain corresponds most closely to the Upper Palaeolithic of Belgium (Dinnis 2008; Pettitt 2008). Comparison of British and Belgian material is therefore especially informative.

Burins busqués can be found in several larger, mixed Belgian Aurignacian assemblages (e.g. Spy, Goyet: Otte 1979), but, as explained, the absence of reliable stratigraphies at these sites renders radio-carbon dating of particular phases of the Aurignacian impossible. Two sites record short-term accumulations of an Aurignacian with burins busqués: Maisières Canal (Atelier de Taille de la Berge Nord-Est area) (Flas et al. 2007) and Trou Walou layer CI-1 (Kozlowski & Sachse- Kozlowska 1993; Pirson et al. in press).

Maisières Canal

The knapping workshop at Maisières Canal is the most securely dated example of this assemblage type, and similarities between *burins busqués* there and from Britain are particularly profound. Examples from Maisières Canal, Hoyle's Mouth and Ffynnon Beuno are worked on large laminar flakes that relate to the initial stages of core reduction of good quality flint nodules. All have a clearly

defined ‘stop-notch’, used to pre-determine the length of detached bladelets, and the bladelet débitage surfaces of all are a comparable length (15mm for both British examples;
11-20mm for examples from Maisières Canal) (Figs. 3 & 9).

The sedimentological sequence at Maisières Canal mirrors the MIS3 chrono-climatological sequence from The Netherlands (van der Hammen 1995), and the Aurignacian of Maisières Canal has been correlated to the Huneborg II Interstadial (c. 33 000-32 000 ^{14}C BP) (Haesaerts 2004). Radiocarbon data recently published by Jacobi et al. (2010) help to confirm the overall reliability of this sequence’s chronology, and a radio- carbon measurement of 30 780 ± 400 BP (GrN-5690) from a higher level provides a minimum age for the Aurignacian assemblage consistent with its position in Huneborg II (Flas et al. 2007). The *burin busqué* assemblage from Maisières Canal is therefore contemporary with the *burin busqué* assemblage from Abri Pataud level 7 (Fig. 6).

Lab code	Measurement	Sample	Reference
GrN-22769	28 010 ± 340	Humic fraction	Draily 1998
GrN-22904	27 760 +780/-710	Humic fraction	Draily 1998
LV-1587	29 800 ± 760	Wood charcoal	Draily 1998
LV-1592	29 470 ± 640	Bone fragments	Draily 1998

Figure 10 Conventional (non-AMS) radiocarbon measurements for the Aurignacian level at Trou Walou. These measurements are here considered to be erroneously young for the archaeological material from that level.

Abb. 10. Konventionelle (nicht-AMS) 14C-Datierungen der Aurignacienschicht aus Trou Walou. Diese Messungen werden hier als fehlerhaft und zu jung für das archäologische Material dieser Schicht angesehen.

Trou Walou

As at Maisières Canal, Recent Aurignacian material from Trou Walou layer CI-1 is apparently a coherent assemblage which accumulated over a short period of time (see Kozlowski & Sachse-Kozlowska 1993). The lithic assemblage contains carinated burins including those which can reasonably be described as *burins busqués* (Fig. 9). The associated osseous industry includes massive-base points made from ivory (Dewez et al. 1993), but no bone/antler points which can be compared to those from Uphill Quarry and from Abri Pataud.

Despite the geographical proximity of Trou Walou and Maisières Canal, and the technological similarity of *burins busqués* from both sites (Fig. 9), current radiocarbon data suggest that they are of different ages. Four radiocarbon dates from Trou Walou layer CI-1 cluster around c. 29 000 ^{14}C BP (Draily 1998) (Fig. 10). All overlap at two standard deviations and there- fore cannot be separated statistically. The two older measurements are often cited as the actual age of the archaeological assemblage (e.g. Djindjian et al. 2003), on account that the charcoal used for LV-1587 apparently comes from a hearth and therefore relates directly to human presence. Therefore the data in Figure 10 have been used to suggest an age of c. 30 000 ^{14}C BP for Aurignacian occupation at the site.

All four dates from Trou Walou come from conventional (non-AMS) radiocarbon laboratories, and reasons to doubt their accuracy are now well-acknowledged. In particular, dates from humic material extracted from sediment samples are ordinarily considered unreliable, due to the significant risk of incorporation of carbon of different ages (Pettitt et al. 2003). The sizeable amount of charcoal and bone material required for conventional dating means that these samples would also have been at risk

of contamination, particularly when multiple bone fragments are used, as was the case for LV-1592. Additionally, these bone and charcoal samples would not have been prepared with, respectively, ultra-filtration or ABOx pre-treatment. These pre- treatment methods have been demonstrated to improve the removal of contaminant carbon, which has previously rendered numerous radiocarbon ages inaccurately young (Higham et al. 2006, 2009; Higham 2011). These dates therefore potentially under- estimate the real age of the archaeological level, and they should be treated cautiously.

In addition to these general chronometric concerns we should also consider the similarity of lithic artefacts at Trou Walou and at Maisières Canal. The technological consistency of bladelet manufacture using the *burin busqué* technique – a technique now known to have been used to produce impressively intricate and consistent end products – is surely good evidence that Aurignacian occupation at Maisières Canal and Trou Walou both occurred during a single and relatively discrete period of Pleistocene time. With more recent evaluation of its age, via more refined dating methods, Maisières Canal is clearly the more reliably dated of the two sites. Its age is there- fore likely to represent the age of both assemblages. This assertion can easily be tested via new radio- carbon dates on humanly-modified material from the Aurignacian of Trou Walou.

Contemporary Recent Aurignacian *burins busqués* in southwestern France, Belgium and Britain

The *burin busqué* assemblages from Maisières Canal and Abri Pataud level 7 both date to the period c. 33 000-32 000 ^{14}C BP. Correction of the radiocarbon data from Abri Pataud level 7 places these assemblages into the period c. 38-36 500 cal BP (Fig. 7). A comparison with the NorthGRIP ice core climate record suggests that the assemblage from Abri Pataud level 7 was probably deposited during the warm climatic period of Greenland Interstadial (GI) 8 (c. 38 500-36 500 cal BP) (Fig. 7). [*For this period there are several problems associated with the correction of radiocarbon data, and comparison of this data with ice core palaeo-temperature records. These include uncertainties associated with the layer counting used to construct the chronology of the NorthGRIP ice core records and uncertainties associated with the correction of radiocarbon data. The latter problem is particularly relevant for the period at the very end of the useful range of the radiocarbon technique (i.e. c. 45 000-35 000 ^{14}C BP). In addition, the* a priori *assumption that climatic changes seen in Greenland ice core records and in Europe are precisely contemporary may itself be questionable (Blaauw et al. 2010). Any correlation between these different datasets inevitably brings with it several sources of potential error which may, of course, become compounded at each step. (See Higham et al. [2011] for an overview of these issues.) This uncertainty is stated here, and the provisional nature of the resultant correlation with NorthGRIP data in particular is stressed. It is hoped, however, that the interpretative merit of using these comparisons is evident to the reader.]* Being the same age as Abri Pataud level 7, this comparison obviously places the Aurignacian of Maisières Canal into this same warm period.

At Maisières Canal, the Aurignacian assemblage does indeed coincide with relatively warm, 'interstadial' conditions, as testified by the humic nature of the sediment within which the assemblage was found (Haesearts 2004). Faunal material from Abri Pataud level 7 includes a notably elevated presence of the warmer-adapted red deer in comparison to the under- and overlying Aurignacian levels, and palynological analysis of levels 8 and 7 suggests a wooded environment, which included warmer-adapted species such as oak (Bouchud 1975: 122; Higham et al.
2011). For level 7 in particular, these are good indicators of the interstadial conditions of the time.

It can be noted here that the Aurignacian layer CI-1 at Trou Walou was also deposited during inter-stadial conditions, as indicated by sedimentological, palynological and faunal analyses (Pirson et al. in press). This would accord with the interpretation of these three assemblages as broadly coeval.

The occupation at Abri Pataud level 6 appears to lie on the boundary between Greenland Interstadials 8 and 7; either within one of these two warm events or in the cold event between them (Fig. 7). Environmental evidence is again consistent with this correlation, with palynological analysis

indicating a return to more open and therefore possibly colder environments than in the underlying level 7 (Higham et al. 2011).

Palaeo-environmental and palaeo-climatic contextual evidence for all of these assemblages is therefore consistent with their comparison against the NorthGRIP ice core climate records in Figure 7.

Overall, in these well-stratified and homogeneous Belgian and French assemblages, an archaeological and chronological consistency can be seen. In these assemblages bladelets were produced using the *burin busqué* method. Abri Pataud 7, Abri Pataud 6 and Maisières Canal are all dated to the period 33-31 000 ^{14}C BP. Although available radiocarbon data for Trou Walou indicate a more recent age, this assemblage is clearly the least well-dated of the sites discussed here. It is here argued that these data are erroneous, and that the Aurignacian of Trou Walou also dates to this same period. All of these assemblages appear to have been deposited during or, in the case of Abri Pataud level 6, shortly after, the prolonged warmth of Greenland Interstadial 8 (Fig. 7).

Containing *burins busqués* and a lozangic-type point, the British Aurignacian is archaeologically congruous with these assemblages. The radiocarbon data from the Uphill Quarry and Hyaena Den points accord chronologically with those from Abri Pataud, as does the date from the less securely Aurignacian artefact from Pin Hole. We can therefore extend the archaeological and chronological accordance of the continental western European Aurignacian into Britain: the Aurignacian appears in Britain c. 32 000 ^{14}C BP.

A second Aurignacian occupation of Britain? The Paviland burin

Despite the fact that British Aurignacian lithic and osseous artefacts come from different sites, they have previously been viewed as deriving from a single and potentially very brief occupation event (Jacobi 1999; Pettitt 2008). The evidence so far discussed provides no reason to contradict this idea. However, the most abundant artefact type in the British Aurignacian – the Paviland burin bladelet core (Fig. 4) – is probable evidence for more than one Aurignacian occupation.

When the raw materials available to Aurignacian groups were of a satisfactory size and quality, only one complex technique was used at any one time to create their micro-bladelet industry (Dinnis in press). Technological deviation is only seen when dictated by raw materials, as explained above for the use of the thick nosed scraper method at Paviland. Unlike for these thick nosed scrapers, nothing about the raw materials used for *burins busqués* or Paviland burins indicates that these techniques were anything other than the primary technological preference. The differences in their technology and the similarity of their bladelet débitage (Fig. 8) are therefore best interpreted as evidence for Aurignacian occupation of Britain at different times, or for an occupation sufficiently prolonged that one technique could be superseded by the other (Dinnis in press).
There is some reason to believe that the Paviland burin method is the more recent of the two methods, even though there are no sites at which it can be precisely dated or where the two are found in stratigraphic succession. In southern France, the *burin busqué* appears as soon as "burins", rather than "scrapers", begin to be used for bladelet production (see Chiotti 2005); since the Paviland burin clearly belongs with the burin group of bladelet production methods, it therefore probably post-dates the *burin busqué*. Commonalities in the technology of both core types are consistent with this interpretation (Dinnis 2008). If this is accepted, then the Paviland burin method could belong to any period post-dating the *burin busqué* until the very end of the northwestern European Aurignacian.

Unfortunately, it is currently not possible to confidently date the end of the northern European Aurignacian, due to a lack of chronological data of sufficient quality. Recent appraisals of the existing data have reached different conclusions. Flas (2008) has suggested that there is an Aurignacian presence in Belgium and northwestern Germany until 28-27 000 ^{14}C BP, whereas Dinnis (2009) has argued that no Aurignacian assemblage post-dates 30 000 ^{14}C BP.

Although I consider it unlikely, the notion of a late persistence of the northern European Aurignacian is intriguing, especially given the new radiocarbon dating of the Red Lady of Paviland (Jacobi & Higham 2008) (Figs. 6 & 7). Now dated to c. 29 000 ^{14}C BP, the Red Lady is apparently older than the Early Gravettian of Maisières Canal, and, at least in the opinion of Jacobi et al. (2010), also therefore older than the Early Gravettian of Britain (Figs. 6 & 7). Paviland, of course, has also yielded the largest known assemblage of Paviland burins. If the Aurignacian of northern Europe does persist until or later than 29 000 ^{14}C BP, if the Red Lady burial is indeed older than the Gravettian of Britain, and if the Paviland burin does actually post- date the *burin busqué*, then Paviland burins and the Red Lady burial at Paviland may have been at least broadly contemporary deposits. Ongoing research aims to address the issue of the duration of the northwestern European Aurignacian (e.g. Pirsson et al. 2011; Dinnis & Flas in prep.). It is hoped that this issue will be resolved in the near future.

Climate, environment and Aurignacian subsistence

Human occupation of Britain during the Upper Palaeolithic was discontinuous, and British terrain was likely to have been empty of humans for long periods of MIS3 (Pettitt 2008). Positioned at the northern fringe of the Pleistocene world, it is certainly tempting to think that warm climatic oscillations would have triggered the extension of human ranges into Britain. Previously, it has been suggested that Aurignacian occupation of Britain may have occurred in Greenland Interstadial 5 (Jacobi et al. 2006), Greenland Interstadial 7 (Dinnis 2008) or, more cautiously, during Greenland Interstadial 6 or 7 (White & Pettitt 2011). Above, it is argued that the climatic trigger for Aurignacian occupation of Britain was actually likely to have been the prolonged warmth of the earlier Greenland Interstadial 8, as recently predicted by Jacobi & Higham (2011).

Here, it is interesting to note the differences between the Aurignacian and the preceding LRJ and succeeding Early Gravettian. Both the LRJ and Early Gravettian contain large lithic points, which, if functioning as weapon tips, would have been suitable for systematic predation of large herbivores on the Northern European Plain. Within LRJ and Early Gravettian assemblages in Britain and Belgium is evidence for hunting of species such as reindeer and wild horse (Jacobi 2007; Jacobi et al. 2010). The Aurignacian toolkit in Britain is very different, with a hunting technology of relatively slender bone points and delicate micro-bladelets which perhaps served as barbs (Hays & Lucas 2001).

Unlike the Aurignacian, archaeological material from the LRJ and the Early Gravettian is distributed across the whole of England. (The restriction of the British Aurignacian to western/northern England and Wales can be seen in Fig. 2). Flas (2009) has suggested that differences in hunting strategy employed in the LRJ and Aurignacian may suffice to explain their different geographical ranges. Where large LRJ lithic points would be used to exploit the big Ice Age game of the "mammoth steppe", Aurignacian osseous points would have been better suited to exploitation of a more varied suite of fauna. Indeed, the upland regions of western and northern Britain, with their undulating landscapes and areas of shelter, would certainly have contained more ecologically varied habitats and are likely to have contained a greater variety of fauna. Perhaps importantly, during the more pronounced warmer periods of MIS3 these same topographically complex regions may also have sustained some tree- cover, and with it the more warmer-adapted fauna which favour the presence of trees (Stewart & Lister 2001; Caseldine et al. 2008). With a flexible hunting kit as suited to spearing large fish or small mammals as to fatally wounding medium or larger sized mammals, Aurignacian subsistence may have been designed to exploit these more ecologically complex habitats.

With direct reference to the climatic ice-core records of Greenland, Greenland Interstadial 8 was the most significant warm oscillation throughout the duration of the Aurignacian, both in its amplitude and, more importantly, its longevity. It is during this period of the Aurignacian more than any other that environments would have had their greatest opportunity to respond to climatic amelioration, and particularly so in western Britain with its relatively mild maritime climate. The appearance of Aurignacian hunter-gatherers in western Britain during or shortly after Greenland Interstadial 8 is

therefore perhaps to be expected. Certainly, when they did appear in Britain, the archaeological record of their presence does not indicate that they were doing anything different from what they were doing in continental Europe to the south and east.

Conclusions

British Aurignacian *burins busqués* are technologically indistinguishable from those found in Belgium and at Abri Pataud in southern France c. 32 000 ^{14}C BP, or c. 37 000 cal BP. Therefore, the Aurignacian can be considered to have appeared in Britain at this same time. The proposed c. 32 000 ^{14}C BP appearance of *burins busqués* accords with the few radiocarbon dates from other sites which directly date Aurignacian occupation of Britain. Morphologically similar lozangic-type osseous points are also present at Abri Pataud and in Britain at this time.
This period apparently coincides with or closely follows the most significant warm phase during the lifetime of the Aurignacian: Greenland Interstadial 8. An environmental response to this climatic amelioration is therefore a plausible reason for the extension of Aurignacian ranges northwards at this time. The weapon systems used during the British Aurignacian suggest exploitation of a varied range of fauna, as does the geographical distribution of the Aurignacian within Britain.
In spite of an overall paucity of material, the presence of two bladelet production techniques suggests that there were at least two Aurignacian occupations of Britain, or that occupation was sufficiently prolonged to encompass the replacement of one by the other. The precise timing of what is interpreted as the more recent of the two techniques – the Paviland burin method – is currently unknown.

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